SPACE SCIENCE AND ENGINEERING CENTER
University of Wisconsin-Madison

20 June 2016

Marlene H. Dortch
Office of the Secretary
Federal Communications Commission
445 12th Street, SW
Washington, D.C. 20554.

Dear Secretary Dortch:

This letter is in response to Public Notice public Notice RM-11681 entitled **COMMENT SOUGHT TO UPDATE THE RECORD ON LIGADO'S REQUEST THAT THE COMMISSION INITIATE A RULEMAKING TO ALLOCATE THE 1675-1680 MHZ BAND FOR TERRESTRIAL MOBILE USE SHARED WITH FEDERAL USE**, released April 22, 2016.

I represent the Space Science and Engineering Center (SSEC) at the University of Wisconsin-Madison (UW), a federally-funded research center within the Graduate School that has conduced satellite-based meteorological research for over 50 years. At SSEC, we are seriously concerned about the ultimate national and world-wide consequences of sharing this band and urge you to protect its use for environmental satellite data uses. Specifically, losing this band for real-time satellite data downlinks would significantly harm SSEC's ability to support our Federal sponsors (especially NASA and NOAA) and a wide array of data users, including over 175 other Universities nationwide. Further, we feel that failure to protect this band in the U.S. would ultimately lead to severely compromising the distribution of meteorological satellite data to many users around the world.

The Space Science and Engineering Center (SSEC) operates a Data Center that ingests high quality data in real-time (i.e. as it is observed and broadcast from space) from several different geostationary satellites, the NOAA polar orbiting satellites, and the EOS polar orbiting satellites Terra and Aqua. Downlinks from the key current and future US geostationary satellites make use of the frequency band in question. In addition to performing a wide array of research with this data, we distribute the data and research products to a wide base of scientific users, private sector companies and to the general public. The SSEC prides itself on assisting NOAA in meeting their mission goals of protecting lives and property.

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The following are answers to your specific inquiries (starting on Page 7 paragraph 3 of the notice):

We seek input on the potential impact of new commercial operations in the 1675-1680 MHz band to the missions of non-federal entities, particularly those engaged in state and local emergency management functions, or in support of land, air, and sea transportation operations, and the feasibility of alternative means for these entities to receive the GOES data that they currently receive directly from the GOES satellites or will receive from GOES-R satellites.

While SSEC has several Federal satellite data users, interference in 1675-1680 MHz band could lead to a significant impact on the following commercial/non-US government users of UW SSEC's data:

- Commercial aircraft manufacturer - research and operations using satellite data products from current GVAR and future GOES-R series satellites. Data noise or delays would result in incomplete information being relayed to aircraft regarding potential significant turbulence.
- Commercial Solar Energy systems companies – Solar energy use forecasting.
- Commercial fishing data provider - Water temperature mapping for directing fisherman.
- Commercial Agriculture interests – calculating crop insolation precipitation and disease modeling.
- Commercial Satellite data resellers

We request comment on which non-federal entities directly access NOAA's data or services delivered by GOES-N and GOES-R satellites, what types of data or services are received directly (as opposed to indirectly through some other source, such as the Internet), and how frequently?

UW SSEC provides data services to the following non-government users:

- Commercial data providers (that in turn support many industries not identified here)
- Commercial aircraft manufacturers
- Commercial solar energy companies
- Commercial fishing suport services
- Non-profit museums (foreign and domestic)
- Non-profit research organizations (foreign and domestic)
- Over 175 universities as part of the Unidata community
- Commercial weather services (providing data and forecasting)

Which frequencies are used?

All of the industries supported in the previous question use GOES-N (and/or will use GOES-R) data, (i.e. the 1675-1680 MHz band)

We seek comment on the ways in which non-federal entities may make use of products or services derived from receipt of data in the 1675-1680 MHz band. These commenters should provide information on how the general public, specific populations, or industry sectors may depend on these services. To the extent that receipt of GOES-N or GOES-R satellite data and services by nonfederal entities would be affected, we seek comment on possible alternatives that might be available for receiving the data and services.

UW SSEC will seek to get data via terrestrial services such as the NOAA PDA, however it has been the experience of UW SSEC that terrestrial sources are subject to greater down time and latencies. (see table below)

Would Ligado's proposal requiring development of a data delivery network provide an effective alternative?

In UW SSEC's experience data delivery networks tend to decrease the reliablilty of our data feeds.

To what extent would this proposal affect data latency and data availability to users, what might be the cost impact to non-federal users and beneficiaries of this data?

Significant latencies are likely to be encountered when network systems are over utilized or when network problems occur. Data availability is likely be impacted as is documented below. The table below shows data losses due to network problems external to SSEC over the last 24 months.

What kinds of steps could be taken to ensure that these non-federal users could continue to receive the data and services through other means?

Providing a C-Band data relay may help mitigate some of these issues. Restricting usage of mobile devices that use the 1675-1680 MHz band in some locations will also mitigate the expected problems.

What would be the combined effect of allowing new terrestrial and existing radiosonde operations on the GOES-N and GOES-R receiving systems until 2021?
No Comment

In particular, we seek comment on whether there are classes of users or uses that can serve to identify the types of users and uses, and whether there may be other effective ways of reaching out to these stakeholders to ensure that their concerns can be addressed.
No Comment

Finally, we seek comment on any other public interest considerations that should be taken into account with respect to any potential proposed allocation and service rules governing terrestrial commercial mobile operations in the 1675-1680 MHz band.

We feel our ability to perform world-class research, teach, and provide such services is highly dependent upon our ability to directly receive the full environmental satellite data broadcast in a real time, 100% reliable manner that only the 1675-1680 MHz band can provide.

The University of Wisconsin-Madison (UW) Space Science and Engineering Center (SSEC) strongly opposes the proposed reallocation of the 1675-1680 MHz band for non-federal terrestrial mobile use. The proposed action will cause unprecedented harm to our critical weather satellite data reception. SSEC relies on antenna access to data in order to provide weather and data services, including aviation safety, to a large host of government, university/research, and commercial entities and have found that internet/cloud data access has not been reliable enough to fulfill these missions.

The UW SSEC has ingested geostationary weather satellite data for over 40 years (since 1974.) It currently has five dedicated L-Band antennas that receive geostationary weather data in the 1675-1680 MHz band. These data are provided to US Federal Government Entities, International Partners, Universities, and commercial users. In addition, those data are used for critical safety warnings not currently provided by any other entities. UW SSEC has invested several hundreds of thousands of dollars in the infrastructure to support weather satellite ingest. UW SSEC has invested

$260,000 in just the last 24 months. (This is for geostationary antenna upgrades and associated electronics only; this does not include processing hardware)

While it has been suggested that the data will be made available via a cloud provider, recent events have proven that a cloud solution is not robust enough to eliminate significant outages. See the table below that lists some of the outages in the last 24 months. All of these outages were due to issues outside of UW SSEC's control.

Internet/Cloud Feed incidences/outages greater than 1 hour in the last 24 months

Data type	Start Date of Impact	Duration	Reason
Himawari Satellite data	8/3/2015	3 hours	Network issue between STAR and SSEC
Himawari Satellite data	9/26/2015	1 hour	NOAA STAR/cloud problem
Himawari Satellite data	9/29/2015	2.5 hours	Anomaly with the Cloud
Himawari Satellite data	10/4/2015	4 hours	Network problems
Himawari Satellite data	10/6/2015	3 hours	Maintenance on the NOAA server
Himawari Satellite data	10/30/2015	1.5 hours	Networking issue at NOAA STAR
Himawari Satellite data	12/2/2015	~2 hours	Networking issues ("internet2 slow")
Himawari Satellite data	12/21/2015	~1 hour	Networking issue "took out College Park and Goddard feeds" as well.
Himawari Satellite data	1/14/2016	~1 hour	Networking issue at NOAA STAR
Himawari Satellite data	3/8/2016	~15 hours	Disk issues at NOAA STAR "STAR has IT on site diagnosing and fixing the disk issues"
Himawari Satellite data	3/24/2016	1 hour	Scheduled Disk work at STAR
Himawari Satellite data	3/24/2016	15 hours	Himawari Cloud server down

Himawari Satellite data	4/11/2016	1.5 hours	Problem with VM at NOAA STAR
Himawari Satellite data	4/14/2016	~14 hours	Problem at NOAA STAR
Himawari Satellite data	4/23/2016	1+	Several alerts off and on 9 a.m. - 6:30 p.m.
Polar Satellite Data DDS	12/24/2015	6 hours 20 minutes	NESDIS emergency maintenance - data storage problem
All NDE	4/20/2016	~50 hours	Firewall problem at ESPC
IODC satellite data	5/28/2014	2.5 hours	Failover testing at ESPC
MET-7/IODC, POES satellite data via DDS, METOP via DDS, WV Terra/Aqua	6/14/2014	~15 hours	Power outage at ESPC
MET-7/IODC, Terra/Aqua, Metop	8/12/2014	5.5 hours	Failover testing at ESPC
MET-7/IODC, POES DDS, METOP, WV Terra/Aqua	10/20/2014	54.5 hours	Network problem at ESPC
MET-7/IODC, WV Terra/Aqua for composites	12/1/2015	4 hours	Failover testing at ESPC
MET-7/IODC, WV Terra/Aqua for composites	4/28/2016	5.5 hours	Failover testing at ESPC
Model GRID/CONDUIT	12/19/2014	~18 hours (approx. 12 delayed ~6 hours lost) ?	Network problems at NCEP
Model GRID/CONDUIT	1/27/15	7.5 hours	Hardware issues at NCEP
Model GRID/CONDUIT	2/5/2015	~2 hours	Internet capacity issue at the NOAA

Model GRID/CONDUIT	4/6/2016	~3.5 hours	Network problems at NCEP
Model GRID/CONDUIT	4/28/2016	~1 hour	NCEP backup site testing

General data user information:

Federal Government interests to which UW SSEC GOES antennas provide data:
NOAA ESPC
NOAA AWC
NOAA SPC
NOAA STAR
NOAA CLASS
FAA
NASA LaRC
NASA MSFC
NTSB

Research/University:
175+ Universities within the Unidata Community

Commercial Users:
US Domestic Airlines, Other US Domestic Airline support, US Domestic Solar Power providers
East Coast Commercial fishing support, US Data resellers

Critical Safety services:
Volcanic ash advisories (supplied to NOAA NWS)

The University of Wisconsin Space Science and Engineering Center thanks you for considering the significant impact this spectrum reallocation has on the reception of high quality reliable satellite data by the UW SSEC and other parties around the US. The University of Wisconsin SSEC urges you to reject this reallocation.

Sincerely,

Henry E. Revercomb

Dr. Henry E. Revercomb
Director, Space Science and Engineering Center
University of Wisconsin-Madison